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ABSTRACT

The study addresses itself to the evaluation of the net social benefits from participation in vocational education at the senior high school level in the State of Ohio. Viewed as an investment in human capital, vocational programs were evaluated in order to estimate the excess of social benefits over social costs that accrue from training an individual in any of the programs offered. Benefits were measured in terms of (1) contributions to the value of goods and services produced in the economy over the individual's working lifetime as a result of completing a vocational program and (2) costs, in terms of the value of the goods and services that had to be given up in order to provide the training. The results for the sample vocational education planning districts were then used to obtain similar estimates for the State's remaining 103 vocational education planning districts. The computed estimates indicated that increasing the participation rate by senior high school students in vocational education programs to 40 percent of average daily membership in all of the vocational education planning districts would result in a statewide increase in net social benefits amounting to a minimum of $108,918,528 and a maximum of $326,951,424. (Author/NJ)

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Martin W. Essex
Superintendent of Public Instruction
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PREFACE

The purpose of the economic analysis of publicly-financed programs is to assist decision-makers in the allocation of a given set of scarce resources among competing uses. With a view to guiding the development of vocational education in the State of Ohio, school districts were organized into vocational education planning districts. These vocational education planning districts differ in size, in organizational form, in the vocational programs they offer and in the level of their participation in vocational education, i.e. in the percentage of the average daily membership enrolled in vocational programs.

The decision on the overall level of participation in vocational education, as well as the array of skill-training programs offered, is appropriately made in the context of expected benefits and costs. This monograph reports on a study that aims at contributing to knowledge indispensable to this decision process.

A number of individuals made valuable contributions to the study. Professors Douglas K. Adie and David C. Klingaman of the Department of Economics, and Professor Robert S. Barcikowski of the Department of Education Research, Statistics and Evaluation, assisted in data collection and read and commented on the manuscript. Professors Meno Lovenstein and Svetozar Pejovich of the Department of Economics served as consultants. Discussions with Professor Ernst Stromsdorfer of Indiana University provided useful insights. Mr. John Pichler served as an able general assistant in various aspects of the study including data collection and computer work. Mr. Jeffrey Simmons provided competent services in processing the data. The manuscript was skillfully typed by Miss Marie Frontera and Ms. Bernie McGuire.

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I

STATEMENT OF THE PROBLEM: PARTICIPATION RATES AND NET BENEFITS FROM VOCATIONAL EDUCATION

A. *Introduction*

A major objective of the State of Ohio's plan for vocational education is to provide by 1974 a preparatory job training vocational program for 40 per cent of all the high school youth 16 years of age and above (and other qualified groups), adjusted to 1977 to provide for 44.4 per cent of students at the 11th and 12th grade level or 16 years of age and above, and other qualified groups.[1]

The acquisition of vocational education involves costs and benefits to society at large as well as to the trainees themselves. Knowledge about the potential net benefits (i.e. the excess of benefits over costs) to society from increasing the percentage of senior high school students who receive job training should assist in the appropriate development of vocational education in the State.

With a view to guiding this development, school districts in Ohio have been organized into *Vocational Education Planning Districts*. These vocational planning districts differ in size, in the vocational program they offer and in organizational form. Of the total 107 vocational districts, 33 are *single* (individual) districts--the jurisdiction of the vocational planning district coincides with that of the school district; 16 are *multiple* (contract) vocational districts, i.e. each vocational planning district is made up of a combination of school districts. The remaining 58 vocational planning districts are *joint vocational school districts*.

Vocational education planning districts vary in their participation rates, i.e. in the percentage of average daily membership enrolled in vocational programs. In Fiscal Year 1973, the participation rate at the 11th and 12th grade level in gainful (job training) vocational programs (excluding

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[1] *Ohio State Plan for the Administration of Vocational Education, Revised* 1972, Department of Education, State of Ohio, Columbus, Ohio, July 1972, p. 79.

those for Special Needs) ranged from 6.35 per cent to a maximum of 49.85 per cent. The average for all vocational education planning districts was 27.50 per cent. Including enrollment in Special Needs' programs the figure was 28.93 per cent. Table 1 lists the 107 vocational education planning districts by organizational form (*single, multiple,* and *joint vocational school district*), and shows their Fiscal Year 1973 participation rates at the 11th and 12th grade level in the following vocational education areas (which include all job training vocational education programs other than Special Needs): *Agricultural Education, Distributive Education, Health Occupations, Home Economics (Gainful), Business and Office Education,* and *Trade and Industrial Education.*

Net benefits from vocational education in each vocational education planning district depend upon the planning district's participation rate. However, net benefits differ among vocational programs, as well as among schools as producers of vocational education. Therefore, any gain from increased participation within a vocational education planning district necessarily relates to the composition of vocational education (i.e. the distribution of participants among vocational programs) as well as to the over-all increase in participation.

TABLE 1

VOCATIONAL PARTICIPATION RATES BY VOCATIONAL EDUCATION PLANNING DISTRICT

(Enrollment in Vocational Education Services As a Percentage of 11th and 12th Grade Average Daily Membership)
FISCAL YEAR 1973

VOCATIONAL EDUCATION PLANNING DISTRICT	NO.	AGRICULTURAL EDUCATION	DISTRIBUTIVE EDUCATION	HEALTH OCCUPATIONS	HOME ECONOMICS (GAINFUL)	BUSINESS AND OFFICE EDUCATION	TRADE AND INDUSTRIAL EDUCATION	TOTAL
I. SINGLE PLANNING DISTRICTS								
1. Lima City	(2)	00.00%	13.94%	01.99%	01.36%	08.87%	20.99%	47.15%
2. Hamilton City	(9)	00.00	05.77	00.00	02.89	07.05	18.77	34.48
3. Middletown City	(10)	00.00	02.45	01.17	00.00	02.27	14.99	20.88
4. West Clermont Local	(13)	00.00	03.54	00.00	05.97	18.11	18.01	45.58
5. Cleveland City	(19)	01.89	03.56	00.28	04.32	13.15	18.51	41.71
6. East Cleveland City	(21)	00.00	01.68	01.51	05.50	06.03	16.84	31.56
7. Maple Heights City	(24)	00.00	01.75	01.56	00.00	16.47	24.66	44.44
8. Sandusky City	(33)	00.00	06.73	01.05	00.00	05.78	15.04	28.80
9. South-Western City	(38)	05.99	03.67	03.13	00.00	16.99	20.07	49.85
10. Cincinnati City	(43)	00.20	03.58	00.19	00.37	07.47	09.06	21.47
11. Northwest Local	(45)	00.00	02.22	03.87	00.00	09.60	15.70	31.39
12. Lorain City	(57)	00.00	02.91	00.25	01.39	16.49	14.67	35.71
13. Oregon City	(59)	00.00	02.88	03.00	04.32	03.83	21.58	35.61
14. Sylvania City	(60)	00.00	02.25	00.00	02.32	04.64	14.04	23.25
15. Toledo City	(61)	00.94	04.76	01.29	00.92	08.97	18.16	35.04
16. Washington Local	(62)	00.00	02.87	00.00	00.00	07.80	13.93	24.60
17. Youngstown City	(64)	00.00	00.57	01.00	00.00	06.16	18.39	26.12

TABLE 1 (cont.)

VOCATIONAL PARTICIPATION RATES BY VOCATIONAL EDUCATION PLANNING DISTRICT

(Enrollment in Vocational Education Services As a Percentage of 11th and 12th Grade Average Daily Membership)
FISCAL YEAR 1973

VOCATIONAL EDUCATION PLANNING DISTRICT	NO.	AGRICULTURAL EDUCATION	DISTRIBUTIVE EDUCATION	HEALTH OCCUPATIONS	HOME ECONOMICS (GAINFUL)	BUSINESS AND OFFICE EDUCATION	TRADE AND INDUSTRIAL EDUCATION	TOTAL
I. SINGLE PLANNING DISTRICTS (cont.)								
18. Switzerland of Ohio Local	(70)	07.46%	00.00%	00.00%	00.00%	05.67%	00.00%	13.13%
19. Dayton City	(71)	00.00	05.70	02.10	02.61	11.21	15.28	36.90
20. Morgan Local	(74)	06.45	00.00	00.00	09.43	17.37	36.73	69.98
21. College Corner Local	(76)	00.00	00.00	00.00	00.00	00.00	00.00	00.00
22. Madison Local	(81)	00.13	09.71	00.64	03.70	12.39	07.66	34.23
23. Mansfield City	(82)	00.00	07.49	01.50	00.00	08.46	18.65	36.11
24. Canton City	(90)	00.00	06.35	00.90	01.64	05.90	14.68	29.47
25. Massillon City	(92)	00.00	08.67	00.00	00.00	14.26	22.38	45.31
26. Plain Local	(93)	01.71	02.81	00.00	01.16	10.75	14.78	31.21
27. Akron City	(95)	00.20	02.64	00.57	02.46	13.22	15.76	34.85
28. Warren City	(100)	01.13	00.00	01.85	01.01	07.41	18.70	30.10
29. Springfield Local	(106)	00.00	03.28	00.43	00.00	03.71	09.84	17.26
30. Ohio Valley Local	(107)	18.17	00.00	00.00	04.48	12.87	03.22	38.74
31. North Canton City	(109)	00.00	02.02	00.00	00.00	12.77	09.54	24.33
32. Jackson Local	(112)	00.00	02.43	00.16	00.00	18.93	05.43	26.86
33. Perry Local	(113)	00.00	02.30	00.00	00.00	16.06	02.66	21.02

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TABLE 1 (cont.)

VOCATIONAL PARTICIPATION RATES BY VOCATIONAL EDUCATION PLANNING DISTRICT

(Enrollment in Vocational Education Services As a Percentage of 11th and 12th Grade Average Daily Membership)
FISCAL YEAR 1973

VOCATIONAL EDUCATION PLANNING DISTRICT	NO.	AGRICULTURAL EDUCATION	DISTRIBUTIVE EDUCATION	HEALTH OCCUPATIONS	HOME ECONOMICS (GAINFUL)	BUSINESS AND OFFICE EDUCATION	TRADE AND INDUSTRIAL EDUCATION	TOTAL
II. MULTIPLE PLANNING DISTRICTS								
1. East Liverpool City	(16)	00.00%	04.65%	01.45%	04.18%	10.00%	16.70%	36.99%
2. Bedford City	(18)	00.00	04.14	00.64	00.00	06.47	15.34	26.59
3. Cleveland Heights/University Heights	(20)	00.00	02.27	00.00	00.65	01.13	02.30	06.35
4. Euclid City	(22)	00.00	02.38	00.20	00.00	03.83	03.08	09.49
5. Lakewood City	(23)	00.02	01.82	00.39	00.00	03.68	05.93	11.84
6. Mayfield City	(25)	00.00	01.19	00.43	02.44	05.20	12.42	21.84
7. Parma City	(26)	00.00	02.05	01.72	01.61	11.31	14.28	30.97
8. Columbus City	(35)	01.21	03.84	00.52	00.92	05.83	03.71	16.03
9. Kenston Local	(41)	01.50	00.87	00.21	02.28	03.40	08.99	16.35
10. Mentor-Willoughby-Eastlake	(53)	00.72	01.47	01.17	01.07	07.07	11.47	22.97
11. Meigs Local	(67)	04.15	00.00	00.00	02.21	21.03	25.31	52.70
12. Mad River Local	(72)	00.00	04.95	00.47	00.00	04.36	07.69	17.47
13. Alliance City	(89)	03.23	00.90	00.19	02.33	11.67	16.41	34.73
14. Barberton City	(96)	00.00	04.68	01.14	00.94	06.93	15.44	29.13
15. Six District Voc. Ed. Compact	(97)	00.00	03.44	01.03	01.01	05.84	11.62	22.94
16. Canton Local	(115)	00.00	03.52	00.00	01.55	19.33	05.15	29.55

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TABLE 1 (cont.)

VOCATIONAL PARTICIPATION RATES BY VOCATIONAL EDUCATION PLANNING DISTRICT

(Enrollment in Vocational Education Services As a Percentage of 11th and 12th Grade Average Daily Membership)
FISCAL YEAR 1973

VOCATIONAL EDUCATION PLANNING DISTRICT	NO.	AGRICULTURAL EDUCATION	DISTRIBUTIVE EDUCATION	HEALTH OCCUPATIONS	HOME ECONOMICS (GAINFUL)	BUSINESS AND OFFICE EDUCATION	TRADE AND INDUSTRIAL EDUCATION	TOTAL
III. JOINT VOCATIONAL SCHOOL DISTRICTS								
1. Apollo JVSD	(1)	09.98%	03.76%	00.43%	00.00%	05.90%	06.12%	26.19%
2. Ashland County JVSD	(3)	10.22	03.03	00.45	00.00	07.42	09.33	30.45
3. Tri-County JVSD	(5)	08.35	04.29	00.00	02.34	04.49	16.58	36.05
4. Belmont County JVSD	(6)	06.65	03.35	01.44	00.00	06.95	17.13	35.52
5. Southern Hills JVSD	(7)	05.31	03.33	00.00	01.56	22.79	09.99	42.98
6. U. S. Grant JVSD	(12)	01.24	04.82	00.00	00.00	08.17	00.00	14.23
7. Columbiana County JVSD	(15)	01.81	02.67	00.16	00.00	04.21	04.74	13.59
8. Darke County JVSD	(29)	14.49	08.87	00.41	00.00	10.44	04.82	39.03
9. Delaware County JVSD	(31)	13.69	05.55	00.00	01.05	04.71	08.71	33.71
10. Fairfield County JVSD	(34)	05.75	01.14	00.04	01.74	06.39	10.41	25.47
11. Central Ohio JVSD	(37)	06.89	01.44	00.40	00.00	08.25	05.62	22.60
12. Callia County JVSD	(40)	09.22	00.66	00.84	00.97	12.44	04.06	28.19
13. Hancock County JVSD	(47)	10.39	03.16	00.00	00.86	07.10	09.49	31.00
14. Hardin County JVSD	(48)	16.91	02.09	01.00	00.00	15.12	08.56	43.68
15. Jefferson County JVSD	(50)	00.78	01.36	00.00	00.00	06.29	03.03	11.46
16. Knox County JVSD	(51)	07.69	04.99	01.02	02.10	07.87	16.11	39.78
17. Lake County JVSD	(52)	00.71	00.89	00.00	01.93	03.52	12.35	19.40
18. Lawrence County JVSD	(54)	00.62	01.19	00.00	00.82	04.15	08.92	16.00
19. Hi-Point JVSD	(56)	13.21	03.67	00.25	02.79	13.74	08.40	42.06

TABLE 1 (cont.)

VOCATIONAL PARTICIPATION RATES BY VOCATIONAL EDUCATION PLANNING DISTRICT

(Enrollment in Vocational Education Services As a Percentage of 11th and 12th Grade Average Daily Membership)
FISCAL YEAR 1973

VOCATIONAL EDUCATION PLANNING DISTRICT	NO.	AGRICULTURAL EDUCATION	DISTRIBUTIVE EDUCATION	HEALTH OCCUPATIONS	HOME ECONOMICS (GAINFUL)	BUSINESS AND OFFICE EDUCATION	TRADE AND INDUSTRIAL EDUCATION	TOTAL
III. JOINT VOCATIONAL SCHOOL DISTRICTS	(cont.)							
20. Medina County JVSD	(66)	03.74%	02.71%	01.25%	00.00%	04.95%	06.79%	19.44%
21. Washington-Nile JVSD	(68)	12.86	02.69	00.24	00.00	10.61	03.32	29.72
22. Upper Valley JVSD	(69)	05.01	03.92	00.14	00.57	11.62	06.18	28.44
23. Pike County JVSD	(77)	02.21	00.00	00.00	00.00	09.33	22.83	34.37
24. Belmont County JVSD	(80)	12.47	07.21	00.00	00.00	18.82	02.45	40.95
25. Pioneer JVSD	(83)	07.26	01.23	01.95	02.40	07.13	18.26	38.23
26. Pickaway-Ross County JVSD	(84)	04.47	05.63	00.00	00.00	06.81	00.90	17.81
27. Vanguard JVSD	(85)	06.77	03.58	01.42	03.43	08.23	18.03	41.46
28. Ashland County JVSD	(86)	00.79	00.67	01.77	02.12	09.40	20.71	35.46
29. Tiffin Area JVSD	(87)	07.88	05.83	00.95	00.00	05.28	07.88	27.82
30. Western Stark JVSD	(94)	00.00	00.00	00.32	00.00	21.93	06.61	28.86
31. South Summit JVSD	(98)	00.00	01.46	00.00	00.00	13.76	09.17	24.39
32. Buckeye JVSD	(101)	03.77	02.04	00.11	00.68	08.29	09.65	24.54
33. Van Wert County JVSD	(102)	17.88	09.30	00.00	01.10	09.69	02.81	40.78
34. Warren County JVSD	(103)	00.00	04.42	00.22	00.00	04.76	10.17	19.57
35. Washington County JVSD	(104)	07.22	01.25	00.30	01.60	13.58	14.88	38.83
36. Wayne County JVSD	(105)	07.16	01.47	02.51	02.94	08.53	16.25	38.86
37. Coshocton Area JVSD	(108)	04.72	04.64	00.00	00.00	13.92	13.02	36.30
38. Crawford-Upper Sandusky JVSD	(110)	04.17	03.39	00.21	00.00	06.79	08.87	23.43

TABLE 1 (cont.)

VOCATIONAL PARTICIPATION RATES BY VOCATIONAL EDUCATION PLANNING DISTRICT

(Enrollment in Vocational Education Services As a Percentage of 11th and 12th Grade Average Daily Membership)
FISCAL YEAR 1973

VOCATIONAL EDUCATION PLANNING DISTRICT	NO.	AGRICULTURAL EDUCATION	DISTRIBUTIVE EDUCATION	HEALTH OCCUPATIONS	HOME ECONOMICS (GAINFUL)	BUSINESS AND OFFICE EDUCATION	TRADE AND INDUSTRIAL EDUCATION	TOTAL
III. JOINT VOCATIONAL SCHOOL DISTRICTS	(cont.)							
39. Tri-Rivers JVSD	(111)	05.35%	04.96%	00.77%	00.60%	06.58%	07.88%	26.14%
40. Eastern JVSD	(114)	04.77	01.84	00.05	01.14	07.43	04.56	19.79
41. Ashtabula County JVSD	(4)	05.27	00.44	01.84	02.19	06.17	11.15	27.06
42. Butler County JVSD	(8)	02.73	06.10	00.00	00.59	07.31	07.34	24.07
43. Springfield-Clark County JVSD	(11)	02.22	01.83	00.87	00.89	06.30	12.67	24.78
44. Cuyahoga Valley JVSD	(27)	00.00	02.08	01.48	01.70	06.91	13.97	26.14
45. Southwest Cuyahoga County JVSD	(28)	01.01	02.74	00.59	01.42	08.06	10.26	24.08
46. Four County JVSD	(30)	14.40	03.81	01.62	01.78	04.51	12.69	38.81
47. EHOVE JVSD	(32)	06.46	03.85	01.19	01.06	06.32	12.42	31.30
48. Eastland JVSD	(36)	03.47	04.07	01.41	00.00	04.40	10.40	23.75
49. Penta County JVSD	(39)	06.00	02.84	00.77	02.63	04.85	11.52	28.61
50. Greene JVSD	(42)	03.01	00.72	00.15	01.36	05.68	11.63	22.55
51. Great Oaks JVSD	(44)	01.64	05.51	00.23	00.70	04.67	04.80	17.55
52. Licking County JVSD	(55)	04.33	04.63	00.14	01.37	07.61	07.61	25.69
53. Lorain County JVSD	(58)	01.97	02.48	00.51	00.67	08.08	10.46	24.17
54. Mahoning County JVSD	(63)	01.88	03.63	00.40	00.63	07.37	08.26	22.17
55. Montgomery County JVSD	(73)	03.65	04.87	01.43	01.93	07.40	12.84	32.12
56. Muskingum JVSD	(75)	08.51	01.46	00.85	02.26	06.62	17.28	36.98
57. Maplewood Area JVSD	(78)	01.14	04.58	00.47	00.47	14.68	05.05	26.39
58. Trumbull County JVSD	(99)	00.00	03.23	00.03	00.00	04.03	02.16	09.45

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II

STATEMENT OF OBJECTIVES: MEASUREMENT OF NET BENEFITS FROM PARTICIPATION IN VOCATIONAL EDUCATION

In order to provide estimates of the net benefits from increased participation in vocational education in Ohio's vocational education planning districts, the study seeks to achieve the following objectives:

(1) Estimate the total net social benefits from vocational programs offered at the 11th and 12th grade levels on the basis of enrollment during Fiscal Year 1973 in each of four sample vocational education planning districts.

(2) Estimate the total net social benefits that would accrue from increasing enrollment in vocational programs at the 11th and 12th grade levels to 40 per cent of the average daily membership in these grades in each of the sample vocational education planning districts.

(3) Based on results obtained from the sample districts, estimate for each of Ohio's 107 vocational education planning districts: (i) the total net social benefits from *Fiscal Year 1973 participation* and (ii) the *potential increase* in these benefits that would come about as a result of increased enrollment in vocational programs to 40 per cent of the average daily membership in the 11th and 12th grades.

(4) Since all of these estimates will be based on the contribution of individual vocational programs to net social benefits, the absolute as well as the relative economic value of the array of vocational programs will be provided.

III

DESCRIPTION OF ACTIVITIES: THE SAMPLE DATA, DESCRIPTION AND SOURCES

A. *The Sample*

A sample of four vocational education planning districts was selected for the study: (A) a *single* (individual) vocational district, *Toledo City School District*, with a Fiscal Year 1973 average daily membership (ADM) of 8,082 in the 11th and 12th grades. (B) A *multiple* (contract) vocational district, *Mentor Exempted Village and Willoughby-Eastlake School Districts*, with an 11th and 12th grade ADM of 5,446. (C) A small *joint vocational school* planning district, *Lake County Joint Vocational School District* (JVSD), with an ADM of 2,129 in the 11th and 12th grades. (D) A large *joint vocational school* planning district, *Penta County JVSD*, with an ADM of 5,736 in the 11th and 12th grades. The four sample planning districts and their member schools and/or school districts are listed in Table 2.

B. *The Data: Description and Sources*

Three sources of data were utilized in the study:

1. Schools and school districts in the four sample vocational education planning districts.

Project investigators visited each of the schools and/or school district offices in the sample planning districts and held discussions with school superintendents and members of the administrative staff about the financial and counselling aspects of vocational education and the organizational relationships of vocational education planning districts. These discussions proved to be very helpful in interpreting the data which were subsequently provided by school system officials. These data included: (i) *Cost Statement*--itemized detailed financial statement of school expenditures incurred during the two budgetary years 1970-1971 and 1971-1972.

TABLE 2

LIST OF SAMPLE VOCATIONAL EDUCATION PLANNING DISTRICTS
AND MEMBER SCHOOL DISTRICTS AND/OR SCHOOLS

Vocational Education Planning District	Member School Districts and/or Schools
Single Planning District	
A. Toledo City School District Toledo, Ohio	1. Bowsher High School 2. Devilbliss High School 3. Libbey High School 4. Macomber Vocational Technical High School 5. Rogers High School 6. Scott High School 7. Spencer Sharples High School 8. Start High School 9. Waite High School 10. Whitney Vocational Technical High School 11. Woodward High School
Multiple Planning District	
B. Mentor Exempted Village and Willoughby-Eastlake School Districts Mentor, Ohio	1. Fairport Harbor Exempted Village 2. Mentor Exempted Village School District 3. Painesville City School District 4. Wickliffe City School District 5. Willoughby-Eastlake City School District
Joint Vocational School Planning Districts	
C. Lake County Joint Vocational School District Painesville, Ohio	1. Lake County Joint Vocational School District 2. Chardon Local School District 3. Kirtland Local School District 4. Madison Local School District 5. Painesville Local School District 6. Perry Local School District

D. Penta County Joint Vocational School District
Perrysburg, Ohio

1. Penta County Joint Vocational School
2. Anthony Wayne Local School District
3. Benton Carroll Salem Local School District
4. Bowling Green City School District
5. Eastwood Local School District
6. Elmwood Local School District
7. Genoa Area Local School District
8. Lake Local School District
9. Maumee City School District
10. North Baltimore Local School District
11. Northwood Local School District
12. Ostego Local School District
13. Perrysburg Exempted Village School District
14. Rossford Exempted Village School District
15. Springfield Local School District
16. Woodmore Local School District

(ii) *Statement of Value of Physical Property*--a detailed listing of the value of the school's physical property (land, improvements, buildings, and equipment) itemized and dated by year of acquisition. Equipment was classified as either *specific* (for use in a particular vocational program), or *general* (not specific to any program). (iii) *Vocational Program Report*. This included a listing, by title and by U.S. Office of Education taxonomy code, of all vocational programs offered in the school. Information provided by program included the following: number of trainees (number of vocational and academic students in the case of comprehensive schools), length of the training period, number of graduates, number employed within one year of graduation, the median beginning hourly wage, and number of instructors (vocational and academic teachers in comprehensive schools). (iv) *Trainee Questionnaires*. Trainees in each school filled out individual questionnaires. In addition to providing a profile of vocational trainees by program (family background, geographical origin, future plans), the questionnaires supplied data on earnings of trainees in the various programs from part-time employment during their training.

2. Unpublished Data Sources

Data on secondary vocational education enrollment by planning district was provided by the *Division of Vocational Education*. These data included Fiscal Year 1973 enrollment in each vocational educational planning district by sex, grade level, and vocational program. The *Division of Vocational Education* also provided data on Fiscal Year 1973 enrollment by grade level in each of Ohio's schools. These data were collated and utilized in computing rates of participation in 11th and 12th grade vocational programs in each of Ohio's 107 vocational planning districts.

3. Published Data Sources

In addition to the primary data listed above, use was made of the following published data sources:

(i) U.S. Department of Labor, Bureau of Labor Statistics, *Annual Area Wage Survey 1972*. This publication provided data on ranges of starting wage rates for a number of geographical areas in Ohio by occupational titles. The data were used to supplement data collected through follow-up studies by individual schools and included in the *Vocational Program Report* as described in 1(iii) above.

(ii) U.S. Department of Labor, *The Length of Working Life for Males 1900-1960*, Manpower Report No. 8, July 1963; and *Work Life Expectancy and Training Needs of Women*, Manpower Report No. 12, U.S. Department of Labor, May 1967. Data in these two publications on labor force participation rates and survival probabilities were used in estimating lifetime earnings for male and female trainees in vocational programs.

(iii) State of Ohio, Department of Education, Division of Computer Services and Statistical Reports, *Costs Per Pupil*. Annual cost data by school district were used to calculate per pupil costs of academic education.

IV

TECHNIQUES OF EVALUATION: FRAMEWORK OF THE ANALYSIS

A. *Vocational Education as Investment: A General Introduction*

Vocational education is a form of investment in men and women--the human resource which, in combination with non-human resources, produces the economy's goods and services. In this context, vocational education performs the function of *upgrading* the supply of human resources and consequently enhances their contribution to the production of goods and services.[2]

As investment options, vocational education programs may be appraised by utilizing cost-benefit analysis, a technique that allows the analyst to determine whether or not a particular investment is worthwhile as well as how worthwhile one investment is relative to another.

The concept of cost-benefit analysis reflects a rudimentary decision rule: a rational decision-maker could be expected to undertake an activity only if anticipated benefits exceed anticipated costs. The determination of benefits and costs, however, is dependent upon the *objectives* of the activity. Once the objectives are specified, benefits consist of the contribution to the objectives that will emerge from the activity. Costs are what must be given up as a consequence of engaging in the activity, i.e. the "opportunity cost" of the resources used. Benefits, therefore, measure the contribution to the objectives; costs measure the reduction in objectives.

The *objectives* of vocational education, like those of all forms of education, are multi-dimensional. An all-encompassing goal such as improvement of well-being (or *welfare*) includes a number of components: First, participants in the educational process enjoy education for its own sake. Moreover, education enables those who participate in it to achieve

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[2] For a discussion of the role of vocational and technical education in *updating* as well as *upgrading* the supply of labor, see I. A. Ghazalah and Svetozar Pejovich, "The Economics of Vocational and Technical Education: A Report on Three Studies," *Review of Social Economy*, Volume XXXI, No. 2, October 1973.

greater or more varied enjoyment in the future. Education, therefore, has an objective of future as well as immediate use as a *consumption good*. A second possible objective of education is increasing the participation of individuals in society. The accomplishment of a personal goal (completion of an educational program) enhances self-confidence and acceptance thereby contributing to greater social participation. Third, education may have the objective of decreasing inequality in economic opportunity by making it possible for those who possess less *non-human* wealth to increase their *human* wealth and thereby enabling them to improve their economic position. Fourth, education has a major objective of raising the productivity of men and women as a human resource and consequently increasing the output of goods and services in the economy. This renders education as an *investment good* in addition to its value as a *consumption good*.

An ideal evaluation of educational programs requires the specification of a single functional relationship which uniquely encompasses all of these objectives. The quantification of all variables in such a comprehensive function remains beyond the realm of possibility, given the current state of the art. Of necessity, therefore, the analysis must be narrowed to those variables that are measurable in a common unit. Since vocational education is principally aimed at increasing the productivity of human resources, this study will limit itself to an evaluation of vocational education as an *investment good*, i.e. in terms of its contribution to the objective of raising the output of goods and services in the economy as measured by the increase in the earning power of participants in vocational education.

Just as benefits and costs of an activity should be evaluated in terms of the objective(s) of the activity, the decision-maker must be specified. It is essential to determine *whose* objective(s) the activity aims at achieving. Subsequently, the benefits and costs are assessed as they relate to the decision-maker.

For purposes of this study investment in vocational education will be evaluated as a *social* decision. Costs and benefits to *society as a whole* will be used.

B. *Vocational Education as Investment: The Criterion*

Evaluation of society's investment in the vocational education of an individual requires the use of an investment criterion--a measure that allows a determination of (1) whether or not the investment is worthwhile and (2) how worthwhile is the investment relative to other investment options.

Training of an individual in each vocational program may be viewed as an investment option. Decisions on investment options involve three elements: *costs*, *benefits*, and *time*. Benefits (and often costs) of an investment occur through time. When the investment decision is being contemplated, the benefits (and costs) that occur in the future must be related to the present. Future benefits (and costs) have a lower value than the same benefits (or costs) available at present. This is due to two principal factors: *First*, a dollar available today will yield more than one dollar in the future due to the productivity of investment. Consequently, a future dollar must be valued as being worth less than a dollar today. *Second*, the principle of positive time preference. The ultimate purpose of economic activity is consumption. Since individuals dislike postponing consumption, the value of a future dollar is less than that of a dollar available today. The upshot of these two factors is that future benefits (and costs) from today's investment decisions must be discounted (evaluated in terms of their present worth) in order to give different weights to benefits and costs depending on the investment's time profile (magnitudes of benefits and costs during each period).

Since the purpose of this study is to determine the net social benefits from investment in vocational education in Ohio's vocational education planning districts, the appropriate investment criterion is the *Social Present Value*. The social present value criterion measures the excess of social benefits from the investment over its social costs with the proper weighting of benefits and costs according to the applicable time profile.

Investment by society in the vocational education of an individual involves *social costs*--the welfare foregone to society from the use of

resources in training the individual rather than in the production of other goods and services. These costs constitute use of resources for the duration of an individual's training. Since the vocational programs included in this study are at the 11th and 12th grade level and therefore are one or two-year programs, all costs may be considered to occur in a single time period. Hence *social costs* may be denoted by C_o where the subscript o refers to initial time period t_o.

Social benefits from investment in the vocational education of an individual constitute the contribution to the objective(s) of the investment. In terms of the objective specified above (Section A), these benefits are the increase in the economy's output of goods and services attributable to the individual's training in a given vocational program. The flow of future benefits can be broken up into discrete magnitudes. For example B_1, B_2, B_3,...,B_n could stand successively for the total benefits expected during the first year following completion of a vocational program; the total benefits expected during the next year, year 2; the total benefits expected during year 3; and so on to the total benefits expected in the final or n^{th} year.

Computationally, an equation to obtain the social present value is as follows:

$$V_o = \frac{B_1}{(1+i)^1} + \frac{B_2}{(1+i)^2} + \frac{B_3}{(1+i)^3} + \ldots + \frac{B_n}{(1+i)^n} - C_o \qquad (1)$$

where V = social present value
C = social costs
B = social benefits
i = discount rate
and subscripts 0, 1, 2, 3,...,n refer to the number of periods (years) from the intital time period 0 to the final period n.

The social present value (V_o) of investment in the vocational education of an individual, then, measures the net contribution to the economy's output of goods and services, attributable to the completion by that individual of the particular vocational program. A positive number for V_o (i.e. any number greater than zero) indicates that in an absolute sense the investment is worthwhile, i.e. the benefits derived exceed the costs.

Each of the three elements in the calculation: social costs, social benefits and time plays a role in determining the social present value.

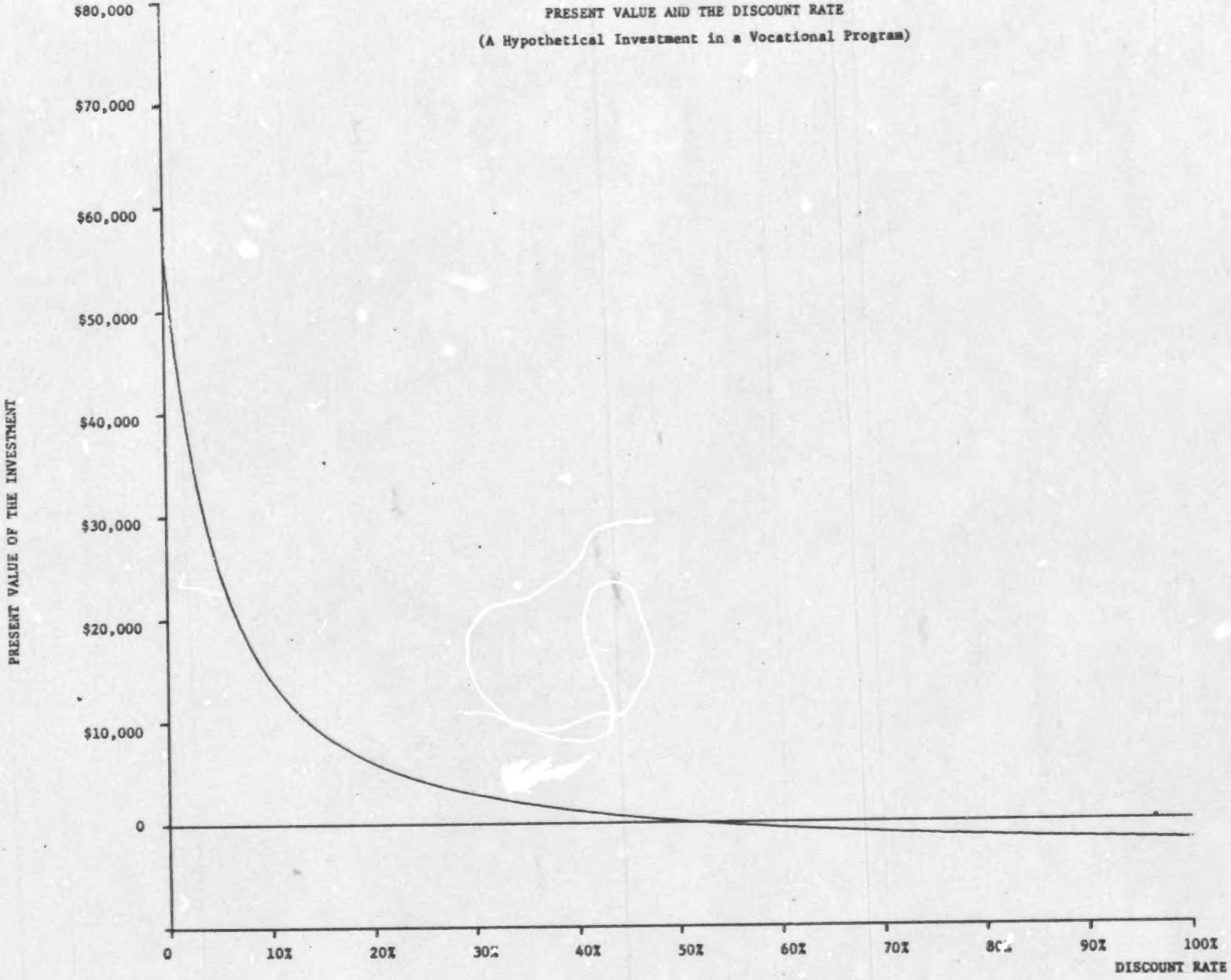
The relationship between benefits and time are particularly important. First, because both the length of time in which benefits extend into the future and the shape of this benefit stream must be determined. Therefore, in addition to estimating the benefits during the first year (B_1) and extrapolating these benefits for the following years (B_2, B_3,...,B_n), it is necessary to ascertain the number of years in the future over which such benefits will continue to accrue, i.e. the number of years that n represents. The present value of a particular investment also depends upon the discount rate i used In general we can determine the present value of a particular investment, for each conceivable rate of discount. The resulting relationship can be plotted as in Figure 1 where the vertical axis measures the present value of the investment in question and the horizontal axis measures i, the rate of discount. The present value of the investment becomes smaller the larger is the rate of discount i; hence the negative slope of the curve. It will be noted that the negative slope crosses the horizontal axis and continues below it. This indicates that at discount rates above some critical rate of discount the present value of the stream becomes negative.

The literature on governmental investments contains competing proposals as to what rate of interest should be used to discount to a single point of time the estimated benefits (and costs) of public sector investments. One such proposal holds that the rate should be determined by and be equal to the interest rate prevailing in the market for government bonds. An alternative suggestion is that the rate chosen should be the one that represents the consensus of policy makers (or of society as a whole)

FIGURE 1

PRESENT VALUE AND THE DISCOUNT RATE

(A Hypothetical Investment in a Vocational Program)



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concerning what the social time preference really is or should be.[3] A third alternative, which is adopted in this study, is to use as a discount rate the "opportunity cost" of the funds used in public investments, i.e. the opportunities foregone as a result of the transfer of funds from the private sector to the public sector.[4] This should be equal to the marginal productivity of capital in the private sector. It is estimated that the "opportunity cost" interest rate was in the 8 to 10 per cent range during the decade of the 1960's.[5] A discount rate of 10 per cent was used in all computations made in this study.

At a given discount rate, the time profile of the present value of social benefits (for a hypothetical investment in an individual in a vocational program) may be illustrated as in Figure 2. The present value of social benefits declines with the individual's age due to (1) decrease over time in the absolute level of benefits as well as (2) discounting of future benefits which renders any given level of benefits of a lower present value the farther in the future the benefits occur.

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[3] See Stephen L. Marglin, "The Social Rate of Discount and the Optimal Rate of Investment," *Quarterly Journal of Economics*, February, 1963, pp. 95-112. Also see the comment on Marglin's article by Gordon Tullock, "The Social Rate of Discount and the Optimal Rate of Investment: Comment," *Quarterly Journal of Economics*, May 1964, pp. 331-36.

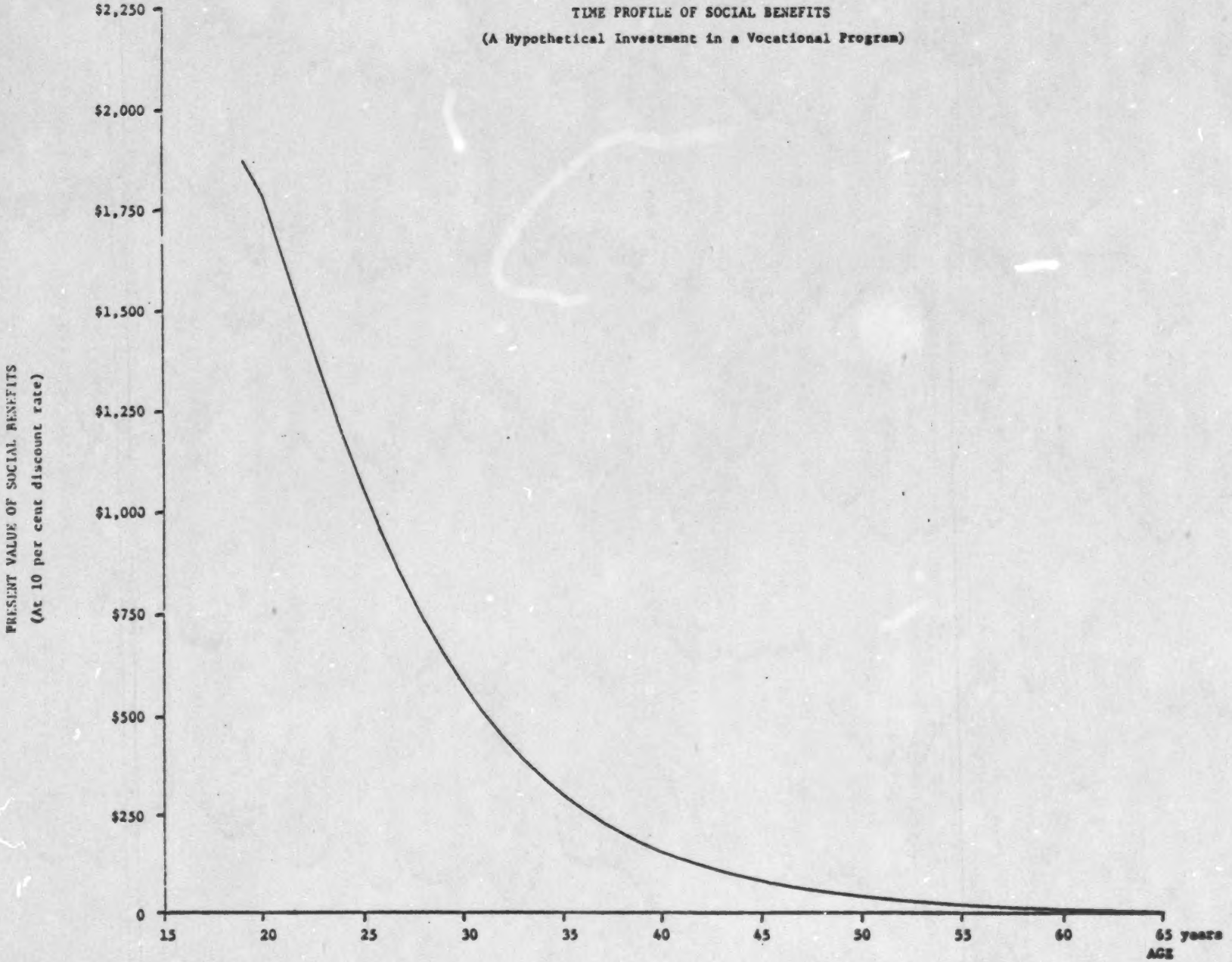
[4] See Jack Hirshleifer, J.C. DeHaven and J.J. Milliman, *Water Supply: Economics, Technology, and Policy*, Chicago 1960; and William J. Baumol, "On the Social Rate of Discount," *American Economic Review*, September 1968, pp. 788-802.

[5] See Jacob A. Stockfisch, "The Interest Rate Applicable to Government Investment Projects," in *Hearings before the Subcommittee on Economy in Government, Joint Economic Committee, 90th Congress, 1st Session* (Washington, D.C.: U.S. Government Printing Office, 1967), p. 137; and U.S. Congress, Joint Economic Committee, "Economic Analysis of Public Expenditure Decisions: Interest Rate Policy and Discounting Analysis," *Report of the Subcommittee on Economy in Government*, 1968, pp. 5ff.

FIGURE 2

TIME PROFILE OF SOCIAL BENEFITS

(A Hypothetical Investment in a Vocational Program)



C. *Social Present Value: The Calculation*

The social present value of providing vocational education was calculated on the basis of two assumptions as to the alternative to investment in the vocational education of an individual at the 11th and 12th grade level. Under the first measure, *Social Present Value I*, the social present value was calculated on the assumption that except for enrollment in a vocational program, the individual would have dropped out of high school and entered the labor market upon completion of the 10th grade. *Social Present Value I*, therefore, views training in a vocational program as an investment in high school dropout prevention and the computed figure indicates the social present value of that investment.

The second measure, *Social Present Value II*, indicates the social present value of training in a vocational program *in lieu of* completing the 11th and 12th grades in an academic curriculum. The assumption in *Social Present Value II*, therefore, is that if the individual had not enrolled in a vocational program, he or she would have completed an academic high school education. In the calculation of both measures of social present value, it was assumed that the individual would not have attended post-secondary institutions of learning.

In addition to the use of two measures of social present value based on the dropout and academic education alternatives, separate calculations were conducted for investment in the vocational education of males and females. Sex differences in labor market participation over the expected lifetime result in different profiles of benefits (i.e. the magnitudes of benefits during each period) for males and females. Hence the social present value under both measures is different for the two sexes.

As shown in Section B above, three factors determine the social present value of investment in the vocational education of an individual: *social costs*, *social benefits*, and *time*. Time influences the result in three ways: (1) the number of periods (years) over which social benefits occur, (2) the magnitude of social benefits during each period and (3) the discount rate--the rate at which social benefits, which come to fruition in the future, are discounted.

All costs are conceptually identical: they are opportunity costs--opportunities which cannot be pursued due to undertaking the particular investment option. They are divided into categories and treated separately merely because of measurement considerations.

Benefits are measured by the increased earnings (and hence contribution to the economy's output of goods and services) attributable to investment in an individual's vocational education. Therefore, the two indices of wage rates and the per cent of time the vocational graduate is employed are incorporated in the measure of benefits.

The following is an explanation of how the three components--costs, benefits, and time--were estimated for the calculation of both measures of social present value, Social Present Value I and Social Present Value II. Table 3 provides a convenient summary.

a. *Social Present Value I*

Under the dropout assumption, vocational education is viewed as an investment in an individual who otherwise would have left school and entered the labor market upon completion of the 10th grade. Social Present Value I was calculated using the following equation, which derives directly from Equation (1)

$$V_o = \sum_{t=1}^{t=n} B_t (1+i)^{-t} - C_o \qquad (2)$$

where V_o = Social Present Value I
B = social benefits
C_o = social costs
i = discount rate (10 per cent)
t = 1, 2,...,n
where n = 47 years for males (age 19 to 65)
and 44 years for females (age 19 to 62)

TABLE 3

VOCATIONAL EDUCATION AS INVESTMENT:

CALCULATION OF THE SOCIAL PRESENT VALUE

Social Present Value I

1. SOCIAL COSTS

Definition: opportunity costs to society at large (welfare foregone to society from the use of resources in the vocational program rather than in the production of other goods and services).

Components:

(i) Direct Costs: costs incurred by the school providing the specific vocational training:

a. current costs
b. capital costs

(ii) Indirect Costs: opportunity costs of non-school inputs:

a. foregone earnings of the trainee during training

2. SOCIAL BENEFITS

Definition: welfare gained by society at large from the individual's training in the vocational program

Components:

1. increased output attributable to the individual's training in the vocational program.

3. TIME

Definition: lifetime of the investment, i.e., the number of time periods (years) during which the flow of benefits and costs is expected to occur.

Social Present Value II

1. SOCIAL COSTS

Definition: opportunity costs to society at large (welfare foregone to society from the use of resources in the vocational program rather than in the production of other goods and services).

Components:

(i) Direct Costs: costs incurred by the school in providing the specific vocational training over and above the cost that would have been incurred by an academic high school:

a. current costs
b. capital costs

2. SOCIAL BENEFITS

Definition: welfare gained by society at large from the individual's training in the vocational program.

Components:

1. output attributable to the individual training in the vocational program over and above the output that would have been realized had the individual completed an academic high school education.

3. TIME

Definition: lifetime of the investment, i.e., the number of time periods (years) during which the flow of benefits and costs is expected to occur.

Components:

1. Costs considered to be incurred in a single time period (the initial time period t_o).

2. Benefits considered to occur over the working lifetime of the individual (up to the age of 65 for males, 62 for females).

Components:

1. Costs considered to be incurred in a single time period (the initial time period t_o).

2. Benefits considered to occur over the five years following graduation from the vocational program.

(i) Social Costs

Social costs (C_o) are the costs of investment to society at large. They include *direct costs* (those incurred by the school system), and *indirect costs* (costs of non-school inputs).

Direct costs comprise *current* (operation and maintenance) costs and *capital* costs (costs of sites, buildings and equipment). The school's total current costs per annum were calculated from each school's *Cost Statement*. The current costs of each vocational program were computed by allocating the school's total current costs on the basis of the ratio of the number of teachers in the program to the total number of teachers in the school. The *average annual current cost* (annual current costs per vocational program trainee) was then obtained by dividing the program's current costs by the number of trainees in the program. The *average capital cost* (capital costs per vocational program trainee) per annum was calculated by first determining each program's annual capital depreciation (assuming a 25-year lifetime for buildings and a 10-year lifetime for equipment) and dividing this figure by the number of trainees in each program. The *average direct cost* (direct cost per trainee) was then computed for each program by adding the average annual current cost and average capital cost and multiplying the sum by the number of years spent by a trainee in the vocational program.

Indirect costs represent the foregone earnings of the trainee. They measure the value of output of goods and services that the trainee would have contributed to the economy for the duration of the training--if he or she had entered the labor market instead of participating in the vocational program. This cost of foregone output was calculated by subtracting from the annual potential earnings as a high school dropout, the annual earnings from part-time employment during training and multiplying the difference by the number of years spent by the trainee in the program. Potential dropout earnings were calculated by assuming an 80 per cent employment rate at an hourly wage of $1.65 (the federal minimum wage). The average annual earnings from part-time employment during training were calculated using questionnaire data supplied by trainees in each of the vocational programs and schools in the sample vocational education planning districts.

Finally, the *average* (i.e. per trainee) *social cost* (C_o) was obtained by summing the average (per trainee) direct and indirect costs.

(ii) Social Benefits

Social benefits were considered to be the difference between expected earnings of a graduate of a specific vocational program and an individual with a 10th grade schooling over the working lifetime--until age 65 for males and age 62 for females.

Social benefits for the first year following graduation (B_1) were calculated by subtracting estimated yearly earnings as a high school dropout with 10th grade education (at an hourly wage of $1.65 and an employment rate of 80 per cent), from the average first year earnings for graduates of the specific vocational program. The latter figure was calculated using wage and employment rates obtained from school follow-up studies and data collected by the Bureau of Labor Statistics, U.S. Department of Labor.[6]

In calculating social benefits for subsequent years (B_2, B_3,...,B_n), it was assumed that wage rates of vocational graduates increase at an annual rate of 3 per cent. For each sex and at each age the employment rate was adjusted by a factor indicating the probabilities of survival and of labor force participation as estimated by the U.S. Department of Labor.[7] A higher rate of growth in wage rates was applied to dropouts at the completion of the 10th grade such that the gap between earnings of dropouts and vocational graduates at the end of the working lifetime diminishes to 15 per cent of its level in year 1 (the first year following graduation). The rationale behind the assumption of a narrowing of the earnings differential is (1) the availability of on-the-job training which tends to make up partially for the initial difference in productivity between dropouts and vocational graduates, and (2) the role of labor unions

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[6] U.S. Department of Labor, Bureau of Labor Statistics, *Annual Area Wage Surveys*, 1972.

[7] Stuart Garfinkle, *The Length of Working Life for Males 1900-1960*, Manpower Report No. 8, U.S. Department of Labor, July 1963; and *Work Life Expectancy and Training Needs of Women*, Manpower Report No. 12, U.S. Department of Labor, May 1967.

in decreasing the differences in remuneration for the two groups. The magnitude of the earnings differential at the age of retirement was selected to approximate the change in the graduate-dropout earnings differential over the working lifetime based on the Morgan and David estimates of earnings by age and education.[8]

b. *Social Present Value II*

In this measure of social present value, training an individual in a vocational program is viewed as an alternative to investment in that individual through an academic curriculum.

The social present value (V_o^x) was calculated using the following equation:

$$V_o^x = \sum_{t=1}^{t=n} B_t^x \, (1+i)^{-t} - C_o^x \qquad (3)$$

where V_o^x = Social Present Value II

B^x = social benefits

C_o^x = social costs

i = discount rate (10 per cent)

t = 1, 2,...,n
where n = 5 years

(i) Social Costs

Social costs (C_o^x), the costs to society of investment in the individual, in this case amounts to the *difference* in cost to the public educational system of providing training in a particular vocational program and of providing education in an academic curriculum. Since the individual, as an academic high school student would not have entered the labor market on a full-time basis, no loss of output (foregone earnings)

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[8] James Morgan and David Martin, "Education and Income," *Quarterly Journal of Economics*, August 1963, pp. 423-437.

results from enrollment in a vocational program. Any part-time earnings were considered to be equally realized whether the individual was enrolled in a vocational or in an academic curriculum. Hence no *indirect costs* are incurred.

The *difference* in direct costs between vocational and academic education was calculated as follows: (1) the *difference* in average current costs per annum was calculated by *subtracting* the annual average current cost (current expenditures per pupil) in the school district in which the particular vocational school is located *from* the annual average current cost of the vocational program in question (calculated as shown under Social Present Value I). (2) The *difference* in annual average capital costs was calculated by *subtracting* the annual per pupil capital depreciation in the school district in which the particular vocational school is located *from* the annual average capital cost for the relevant vocational program (calculated as shown under Social Present Value I). The average (i.e. per trainee) social cost (C_o^x) was then calculated by summing up the figures obtained in (1) and (2) and multiplying the sum by the number of years the trainee spent in the vocational program.

(ii) Social Benefits

Social benefits (B^x) were considered to be the *difference* between earnings of a graduate of the particular vocational program *and* earnings of an academic high school graduate. For the first year, estimated earnings of an academic high school graduate were based on a wage rate of $1.85 per hour and an employment rate of 80 per cent. These earnings were then subtracted from the average earnings of graduates of the specific vocational program to obtain the first year's benefits. An annual growth rate of 3 per cent in the wage rate of the vocational graduate was assumed thereafter and a higher growth rate for the academic high school graduate such that the entire earnings differential was eliminated by the end of the fifth year following graduation. The rationale for this assumption is that since the number of years of

schooling is virtually the same under both investment options, the earnings differential will be eliminated within five years, primarily through on-the-job training.[9]

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[9] Estimates of the length of time over which the vocational-academic differences in benefits continue, following equal number of years of schooling, vary from 6 to 10 years. See Max U. Eininga, *The Process and the Product of T&I High School Level Vocational Education in the United States: The Product*, Pittsburgh, Pennsylvania: American Institute for Research, September 1965; and T. Hu, M.T. Lee, and Ernst W. Stromsdorfer, *A Cost-Effectiveness Study of Vocational Education: A Comparison of Vocational and Non-Vocational Education in Secondary Schools, Final Report*, University Park: Pennsylvania State University, Institute for Research on Human Resources, March 1969.

V

CONTRIBUTIONS OF THE STUDY: RESULTS AND CONCLUSIONS

A. *The Results*

1. The Sample Vocational Education Planning Districts

(i) *Net Social Benefits from Fiscal Year 1973 Participation*

Equations 2 and 3 (pages 24 and 29) were applied to the data obtained by program on member schools in each of the four sample vocational education planning districts. The results, based on a computer program written to execute the necessary calculations, provided measures of the social present value (*Social Present Value I* and *Social Present Value II*) per trainee by vocational program for every member school in each of the four sample vocational education planning districts. The computed figures were then used to calculate *weighted* averages (averages weighted by program enrollment) by program for each of the four sample vocational education planning districts. The results are shown in Table 4. Each of the figures in this table indicates the estimated Social Present Value I and Social Present Value II per trainee in each of the evaluated programs. For example, an investment in the training of an individual, who otherwise would have dropped out of high school, in the Agricultural Production program (in Vocational Education Planning District "D") is estimated to result in net social benefits of $13,475, if that individual is male, $5,941 if female. The working life-time social benefits from the training of an individual in this program, on the average, exceed the social costs by that amount, i.e. the value of the economy's output of goods and services increases over the working life-time of an average graduate of this program by this amount. If the individual's completion of the vocational program was *in lieu* of graduation from an academic high school, the net social benefits (Social Present Value II) from the same vocational training would be an estimated $3,608 (male), $2,609 (female).

TABLE 4

SOCIAL PRESENT VALUE PER TRAINEE BY PROGRAM

SAMPLE VOCATIONAL EDUCATION PLANNING DISTRICTS
(Weighted Averages)

PROGRAM (Taxonomy Code)	Vocational Education Planning District "A"				Vocational Education Planning District "B"				Vocational Education Planning District "C"				Vocational Education Planning District "D"			
	Present Value I		Present Value II		Present Value I		Present Value II		Present Value I		Present Value II		Present Value I		Present Value II	
	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female
AGRICULTURE ED. (1.0000)																
Agr. Production (1.0100)													$13,475	$ 5,941	$ 3,608	$ 2,609
Farm Bus. Mgt. (1.0104)													11,985		3,283	
Agr. Suppl/Serv. (1.0200)													5,575	1,743	1,511	1,075
Agr. Mechanics (1.0300)													11,798		4,076	
Horticulture (1.0500)	$ 5,417	$ 1,621	$ 2,273	$ 1,842	$ 6,692	$ 2,056	$ 2,230	$ 1,671					5,775	1,621	2,724	2,239
DISTRIBUTIVE ED. (4.0000)																
Apparel & Acces. (4.0200)	5,044	1,818	1,046	785									4,980	2,088	757	546
Fin. & Credit (4.0400)	9,323	3,427	1,236	566												
Food Distribut. (4.0600)	10,235	4,563	1,862	1,226	9,299	3,855	1,994	1,393								
Food Services (4.0700)	8,070	3,309	1,612	1,116	6,980	3,301	1,202	830								
Gen. Merchand. (4.0800)	9,142	3,935	2,252	1,666	9,095	4,171	2,057	1,536	$ 8,695	$ 3,718	$ 1,645	$ 1,034	10,007	4,333	3,205	2,488
Hardw., Bldg. Mt. (4.0900)	10,400	4,227	1,889	1,176												
Hotel & Lodg. (4.1100)	16,394	6,470	2,138	852												
Industrial Mkt. (4.1200)	6,207	2,060	798	395												
Personal Serv. (4.1500)	6,846	2,633	1,367	945												
Petroleum (4.1600)	9,906	3,812	1,515	814												
HEALTH OCC. ED. (7.0000)																
Dental Assisting (7.0101)						2,066		1,088						1,259		2,430

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TABLE 4 (cont.)

SOCIAL PRESENT VALUE PER TRAINEE BY PROGRAM

SAMPLE VOCATIONAL EDUCATION PLANNING DISTRICTS

(Weighted Averages)

PROGRAM (Taxonomy Code)	Vocational Education Planning District "A"				Vocational Education Planning District "B"				Vocational Education Planning District "C"				Vocational Education Planning District "D"			
	Present Value I		Present Value II		Present Value I		Present Value II		Present Value I		Present Value II		Present Value I		Present Value II	
	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female
Dental Lab. Tech. (7.0103)					$12,785	$ 6,079	$ 2,537	$ 1,743					$14,589	$ 5,674	$ 2,010	$ 878
Prac. Voc. Nurse (7.0302)					4,653	1,098	2,061	1,668								
Nurses' Aide (7.0303)	$ 4,682	$ 1,832	$ 1,522	$ 1,236	5,834	2,126	1,189	854								
HOME ECON. ED. (9.0000)													2,842	-215	835	518
Child Care (9.0201)					2,010	-88	1,045	874								
Foods Service (9.0203)	5,590	2,165	1,790	1,417					$ 7,064	$ 2,480	$ 1,787	$ 1,237	5,511	1,559	2,646	2,192
Community & Home (9.0205)													4,497	1,433	1,355	1,118
BUS. & OFFICE ED. (14.0000)													5,715	1,873	2,112	1,701
Acct. & Comput. (14.0100)	6,075	2,034	1,040	616	7,217	2,533	1,977	1,450					6,802	2,020	3,007	2,426
Data Processing (14.0200)	6,982	2,770	1,906	1,412	6,928	2,125	2,312	1,728	8,550	2,807	1,939	1,211	6,598	2,370	3,089	2,593
Cler., Office Mac (14.0300)	6,431	2,574	1,882	1,477	6,430	2,153	1,828	1,347								
Material Support (14.0500)	5,695	1,257	1,457	934									8,224	3,014	3,169	2,542
Steno, Secr. (14.0700)	7,619	2,774	2,085	1,495	7,671	2,982	2,685	2,118								
Typing (14.0900)	8,903	3,650	1,930	1,306	8,653	3,099	2,999	2,300								
Misc. Office (14.9900)	5,168	1,677	1,439	1,071												
TRADE & IND. ED. (17.0000)																
Appliance Repair (17.0200)	11,240	5,178	2,693	1,916												
Body & Fender (17.0301)	10,901	5,146	2,772	2,043	10,277	4,322	2,500	1,739	12,284	5,137	2,926	1,983	11,729	4,803	3,608	2,699
Mechanics (17.0302)	17,039	8,502	4,056	2,901	13,489	6,053	3,209	2,222	17,147	7,876	3,642	2,374	17,701	7,794	5,121	3,756

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TABLE 4 (cont.)

SOCIAL PRESENT VALUE PER TRAINEE BY PROGRAM

SAMPLE VOCATIONAL EDUCATION PLANNING DISTRICTS
(Weighted Averages)

PROGRAM (Taxonomy Code)	Vocational Education Planning District "A"				Vocational Education Planning District "B"				Vocational Education Planning District "C"				Vocational Education Planning District "D"			
	Present Value I		Present Value II		Present Value I		Present Value II		Present Value I		Present Value II		Present Value I		Present Value II	
	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female
Specialization (17.0303)	$13,305	$ 5,376	$ 3,832	$ 2,770	$10,566	$ 4,664	$ 2,561	$ 1,890								
Aircraft Maint. (17.0401)	16,553		4,215													
Bus. Mach. Main. (17.0600)	13,432	5,319	3,677	2,586												
Commercial Art (17.0700)	11,028	4,882	2,771	1,982	11,380	4,614	3,191	2,307					$10,274	$ 3,579	$ 3,741	$ 2,867
Carpentry (17.1001)													14,263		4,434	
Electricity (17.1002)	24,973		6,119													
Masonry (17.1004)													15,948		3,402	
Glazing (17.1009)	17,316		4,357													
Drafting Occup. (17.1300)	12,744	5,409	3,570	2,599	12,750	5,217	3,045	2,043	$15,039	$ 6,545	$ 3,344	$ 2,195	14,061	5,452	4,387	3,221
Electronics Oc. (17.1500)					14,334	5,808	4,128	2,975					16,292	7,137	4,763	3,513
Ind. Electron. (17.1502)	14,650	6,769	3,746	2,691	16,060	7,637	3,459	2,321	16,396	7,009	3,629	2,344				
Radio/TV (17.1503)	6,488	2,855	2,274	1,868									6,121	1,583	2,549	2,005
Foreman, Supvr. (17.1700)					6,486	2,516	1,438	1,063								
Graphics Arts (17.1900)	11,298	4,538	3,294	2,410	13,414	5,049	3,240	2,111					11,952	5,008	3,877	2,965
Foundry (17.2301)	26,622		6,368													
Machine Shop (17.2302)	18,516		4,500		16,773		4,650		19,115		3,978		15,565		4,482	
Sheet Metal (17.2305)	20,673		5,197													
Weld. & Cutting (17.2306)	18,713	9,294	4,660	3,170	18,562	8,571	4,947	3,559	18,790	8,669	3,915	2,418	16,749	7,506	4,718	3,455
Cosmetology (17.2602)	6,199	1,414	1,037	455	5,098	1,244	1,738	1,298	5,939	1,547	1,546	1,024	2,960	542	2,532	2,160

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TABLE 4 (cont.)

SOCIAL PRESENT VALUE PER TRAINEE BY PROGRAM

SAMPLE VOCATIONAL EDUCATION PLANNING DISTRICTS
(Weighted Averages)

PROGRAM (Taxonomy Code)	Vocational Education Planning District "A"				Vocational Education Planning District "B"				Vocational Education Planning District "C"				Vocational Education Planning District "D"			
	Present Value I		Present Value II		Present Value I		Present Value II		Present Value I		Present Value II		Present Value I		Present Value II	
	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female
Quan. Food Occ. (17.2300)	$ 4,718	$ 1,707	$ 1,539	$ 1,228												
Small Eng. Rep. (17.3100)	12,279		3,765													
Tailoring (17.3302)					$ 4,766	$ 2,155	$ 796	$ 628					$ 9,957		$ 2,010	
OCCUPATIONAL WORK EXPERIENCE (17.9999)	7,909	3,625	2,180	1,675	8,406	4,057	2,114	1,613	$ 8,717	$ 3,899	$ 1,422	$ 917	7,904	3,779	1,570	1,090

Notes:

1. Social Present Value I measures the present value of the excess of working life-time social benefits over social costs per trainee assuming the trainee would have dropped out of high school except for enrollment in the vocational program.
2. Social Present Value II measures the present value of the excess of social benefits over social costs per trainee assuming the trainee's enrollment in the vocational program is in lieu of completing academic high school education.
3. All social present values shown in the table are weighted averages, i.e. average social present values weighted by program enrollment.
4. Social present values are not shown for either sex if no members of that sex were enrolled in the program during Fiscal Year 1973.

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The social present value figures, under either measure, indicate the *absolute* as well as the *relative* social economic value of the various programs as a form of investment in human capital. A positive value (a dollar figure greater than zero) indicates that the program is a worthwhile investment: social benefits accruing from the investment exceed the social costs incurred. The magnitude of the social present value indicates *how worthwhile* is the investment. Hence the *relative* social economic values of the programs as investments in human capital are reflected in the relative magnitudes of the social present values obtained.

On an absolute basis, all evaluated programs, with the exception of Child Care, have *positive* social present values and hence are unequivocably worthwhile investments. Table 5 shows the *mean* social present values for those vocational programs evaluated in the four sample vocational education planning districts and their ranking from highest (1) to lowest social present value. Table 6 groups all evaluated vocational programs (in the four sample vocational planning districts) by vocational education area. *Trade and Industrial Education* has the highest social present value, *Home Economics (Gainful)* the lowest. The rankings differ under *Social Present Value II* from those under *Social Present Value I*. There is also a difference in ranking of vocational education areas by social present values for males and females.

The *total net social benefits* that accrue from vocational education investment in each of the four sample vocational education planning districts were calculated as follows:

First, the social present value per trainee (as shown in Table 4) was multiplied by enrollment figures (adjusted for probability of graduation) for males and females in each of the programs during Fiscal Year 1973. This provided an estimate of the net social present value realized from investment in each of the programs. Second, total net social present value of investment in all of the programs offered was obtained by summing up over all programs within the vocational education planning district. The results are shown in Column (a), Table 7. The figure of $22,357,776 (*Social Present Value I*), for example, represents the estimated net social benefits from investment in the vocational education of trainees enrolled during Fiscal Year 1973 in all programs offered in Vocational Education Planning

TABLE 5

MEAN SOCIAL PRESENT VALUES BY PROGRAM

(All Four Sample Vocational Education Planning Districts)

VOCATIONAL PROGRAM	MEAN SOCIAL PRESENT VALUE I				MEAN SOCIAL PRESENT VALUE II			
	Males	Ranking	Females	Ranking	Males	Ranking	Females	Ranking
AGRICULTURE ED. (1.0000)								
Agr. Production (1.0100)	$13,475	(16)	$ 5,941	(6)	$ 3,608	(14)	$ 2,609	(4)
Farm Bus. Mgt. (1.0104)	11,985	(19)			3,283	(18)		
Agr. Suppl/Serv. (1.0200)	5,575	(45)	1,743	(36)	1,511	(42)	1,075	(31)
Agr. Mechanics (1.0300)	11,798	(21)			4,076	(10)		
Horticulture (1.0500)	5,961	(43)	1,766	(35)	2,409	(27)	1,917	(14)
DISTRIBUTIVE ED. (4.0000)								
Apparel & Acces. (4.0200)	5,012	(49)	1,953	(34)	902	(52)	666	(41)
Fin. & Credit (4.0400)	9,323	(29)	3,427	(20)	1,236	(50)	566	(43)
Food Distribut. (4.0600)	9,732	(28)	4,209	(16)	1,928	(35)	1,310	(25)
Food Services (4.0700)	7,525	(34)	3,305	(22)	1,407	(46)	973	(35)
Gen. Merchand. (4.0800)	9,235	(30)	4,039	(17)	2,290	(29)	1,681	(20)

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TABLE 5 (cont.)

MEAN SOCIAL PRESENT VALUES BY PROGRAM
(All Four Sample Vocational Education Planning Districts)

VOCATIONAL PROGRAM	MEAN SOCIAL PRESENT VALUE I				MEAN SOCIAL PRESENT VALUE II			
	Males	Ranking	Females	Ranking	Males	Ranking	Females	Ranking
Hardw., Bldg. Mt. (4.0900)	$10,400	(26)	$ 4,227	(15)	$ 1,889	(36)	$ 1,176	(29)
Hotel & Lodg. (4.1100)	16,394	(8)	6,470	(5)	2,138	(32)	852	(38)
Industrial Mkt. (4.1200)	6,207	(41)	2,060	(32)	798	(53)	395	(44)
Personal Serv. (4.1500)	6,846	(36)	2,633	(24)	1,367	(47)	945	(36)
Petroleum (4.1600)	9,906	(27)	3,812	(19)	1,515	(41)	814	(39)
HEALTH OCC. ED. (7.0000)								
Dental Assisting (7.0101)			1,663	(39)			1,759	(18)
Dental Lab. Tech. (7.0103)	13,687	(14)	5,877	(7)	2,274	(30)	1,311	(24)
Prac. Voc. Nurse (7.0302)	4,653	(52)	1,098	(43)	2,061	(34)	1,668	(21)
Nurses' Aide (7.0303)	5,258	(47)	1,979	(33)	1,356	(48)	1,045	(34)
HOME ECON. ED. (9.0000)								
Child Care (9.0201)	2,426	(54)	-152	(44)	940	(51)	696	(40)

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TABLE 5 (cont.)

MEAN SOCIAL PRESENT VALUES BY PROGRAM

(All Four Sample Vocational Education Planning Districts)

VOCATIONAL PROGRAM	MEAN SOCIAL PRESENT VALUE I				MEAN SOCIAL PRESENT VALUE II			
	Males	Ranking	Females	Ranking	Males	Ranking	Females	Ranking
Foods Service (9.0203)	$ 6,055	(42)	$ 2,068	(31)	$ 2,074	(33)	$ 1,615	(22)
Community & Home (9.0205)	4,497	(53)	1,433	(40)	1,355	(49)	1,118	(30)
BUS. & OFFICE ED. (14.0000)								
Acct. & Comput. (14.0100)	6,336	(39)	2,147	(30)	1,710	(39)	1,256	(26)
Data Processing (14.0200)	7,316	(35)	2,431	(26)	2,291	(28)	1,694	(19)
Cler., Office Mac. (14.0300)	6,486	(38)	2,366	(27)	2,266	(31)	1,806	(16)
Material Support (14.0500)	5,695	(44)	1,257	(41)	1,457	(43)	934	(37)
Steno, Secr. (14.0700)	7,838	(33)	2,923	(23)	2,647	(24)	2,052	(12)
Typing (14.0900)	8,778	(31)	3,375	(21)	2,465	(25)	1,803	(17)
Misc. Office (14.9900)	5,168	(48)	1,677	(38)	1,439	(44)	1,071	(32)
TRADE & IND. ED. (17.0000)								
Appliance Repair (17.0200)	11,240	(24)	5,178	(10)	2,693	(23)	1,916	(15)

TABLE 5 (cont.)

MEAN SOCIAL PRESENT VALUES BY PROGRAM

(All Four Sample Vocational Education Planning Districts)

VOCATIONAL PROGRAM	MEAN SOCIAL PRESENT VALUE I				MEAN SOCIAL PRESENT VALUE II			
	Males	Ranking	Females	Ranking	Males	Ranking	Females	Ranking
Body & Fender (17.0301)	$11,298	(22)	$ 4,852	(13)	$ 2,952	(21)	$ 2,116	(11)
Mechanics (17.0302)	16,344	(9)	7,556	(2)	4,007	(11)	2,813	(3)
Specialization (17.0303)	11,936	(20)	5,020	(11)	3,197	(20)	2,330	(10)
Aircraft Maint. (17.0401)	16,553	(7)			4,215	(9)		
Bus. Mach. Main. (17.0600)	13,432	(17)	5,319	(9)	3,677	(12)	2,586	(5)
Commercial Art (17.0700)	10,894	(25)	4,358	(14)	3,234	(19)	2,385	(9)
Carpentry (17.1001)	14,263	(13)			4,434	(6)		
Electricity (17.1002)	24,973	(2)			6,119	(2)		
Masonry (17.1004)	15,948	(10)			3,402	(17)		
Glazing (17.1009)	17,316	(6)			4,357	(8)		
Drafting Occup. (17.1300)	13,649	(15)	5,656	(8)	3,587	(15)	2,515	(6)
Electronics Oc. (17.1500)	15,313	(12)	6,473	(4)	4,446	(5)	3,244	(1)

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TABLE 5 (cont.)

MEAN SOCIAL PRESENT VALUES BY PROGRAM

(All Four Sample Vocational Education Planning Districts)

VOCATIONAL PROGRAM	MEAN SOCIAL PRESENT VALUE I				MEAN SOCIAL PRESENT VALUE II			
	Males	Ranking	Females	Ranking	Males	Ranking	Females	Ranking
Ind. Electron. (17.1502)	$15,702	(11)	$ 7,138	(3)	$ 3,611	(13)	$ 2,452	(8)
Radio/TV (17.1503)	6,305	(40)	2,219	(28)	2,412	(26)	1,937	(13)
Foreman, Supvr. (17.1700)	6,486	(37)	2,516	(25)	1,438	(45)	1,063	(33)
Graphic Arts (17.1900)	12,221	(18)	4,865	(12)	3,470	(16)	2,495	(7)
Foundry (17.2301)	26,622	(1)			6,368	(1)		
Machine Shop (17.2302)	17,492	(5)			4,403	(7)		
Sheet Metal (17.2305)	20,673	(3)			5,197	(3)		
Weld. & Cutting (17.2306)	18,204	(4)	8,510	(1)	4,485	(4)	3,153	(2)
Cosmetology (17.2602)	5,299	(46)	1,187	(42)	1,713	(38)	1,234	(27)
Quan. Food Occ. (17.2900)	4,718	(51)	1,707	(37)	1,539	(40)	1,228	(28)
Small Eng. Rep. (17.3100)	11,118	(23)			2,888	(22)		
Tailoring (17.3302)	4,766	(50)	2,155	(29)	796	(54)	628	(42)
OCCUPATIONAL WORK EXPERIENCE (17.9999)	8,234	(32)	3,840	(18)	1,822	(37)	1,324	(23)

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TABLE 6

MEAN SOCIAL PRESENT VALUE
BY VOCATIONAL EDUCATION AREA
(All Four Sample Vocational Education Planning Districts)

VOCATIONAL EDUCATION AREA	MEAN SOCIAL PRESENT VALUE I				MEAN SOCIAL PRESENT VALUE II			
	Males	Ranking	Females	Ranking	Males	Ranking	Females	Ranking
AGRICULTURAL EDUCATION	$ 9,759	(2)	$ 3,150	(3)	$ 2,977	(2)	$ 1,867	(2)
DISTRIBUTIVE EDUCATION	9,058	(3)	3,614	(2)	1,547	(5)	938	(6)
HEALTH OCCUPATIONS	7,866	(4)	2,654	(4)	1,897	(4)	1,446	(4)
HOME ECONOMICS (GAINFUL)	4,326	(6)	1,116	(6)	1,456	(6)	1,143	(5)
BUSINESS OFFICE EDUCATION	6,802	(5)	2,311	(5)	2,039	(3)	1,517	(3)
TRADE AND INDUSTRIAL EDUCATION	13,500	(1)	4,621	(1)	3,479	(1)	2,083	(1)

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District "A" (Toledo City School District), assuming that all these trainees would have dropped out of high school if they had not enrolled in vocational programs. If they would have completed an academic high school education, had they not participated in vocational education, the total net social benefits (*Social Present Value II*) would amount to $6,677,141.

(ii) *Potential Increase in Total Net Social Benefits*

Estimates of *total net social benefits* for each of the sample vocational education planning districts are based on enrollment by program in Fiscal Year 1973. In all of the four sample vocational education planning districts, the percentage of 11th and 12th grade pupils enrolled in the six vocational education services[10] during the Fiscal Year 1973 was below 40 per cent. The actual participation rates were 35.04% (Toledo City), 22.97% (Mentor-Willoughby-Eastlake), 19.40% (Lake County), and 28.61% (Penta County).

The potential *increase* in net social benefits from increasing participation to the 40 per cent level in each of the four sample vocational education planning districts, was estimated as follows:

First, the total net social benefits from "40 per cent participation" were estimated. Enrollment in the various programs during Fiscal Year 1973 was used as a base for the composition of vocational education enrollment in each of the vocational education planning districts. A computation of enrollment in each program necessary to achieve a 40 per cent over-all participation rate within the planning district was then made assuming the same percentage of total enrollment by program as existed in Fiscal Year 1973. The projected enrollment in each program was then used to calculate total net social benefits that would result from achieving a 40 per cent participation rate, on the basis of measures of social present value per trainee by program. The results for each of the sample vocational education planning districts are shown in Column (b), Table 7.

Second, the estimated total net social benefits with the Fiscal Year 1973 participation rate, shown in Column (a), were then subtracted from the equivalent figure for "40 per cent participation"--Column (b)--to

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[10] The six vocational education areas of: Agricultural Education, Distributive Education, Health Occupations, Home Economics (Gainful), Business and Office Education, and Trade and Industrial Education.

TABLE 7

TOTAL NET SOCIAL BENEFITS:

SAMPLE VOCATIONAL EDUCATION PLANNING DISTRICTS

	TOTAL NET SOCIAL BENEFITS FISCAL YEAR 1973 PARTICIPATION (a)		TOTAL NET SOCIAL BENEFITS 40 PER CENT PARTICIPATION (b)		POTENTIAL INCREASE IN TOTAL NET SOCIAL BENEFITS (c)	
	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II
Vocational Education Planning District "A" (Toledo City School District)	$22,357,776	$ 6,677,141	$25,551,728	$ 7,631,015	$ 3,193,954	$ 953,875
Vocational Education Planning District "B" (Mentor Exempted Village and Willoughby-Eastlake School Districts)	8,860,257	2,910,285	16,109,554	5,291,427	7,249,297	2,381,142
Vocational Education Planning District "C" (Lake County Joint Vocational School District)	3,985,068	988,804	8,216,633	2,038,770	4,231,565	1,049,966
Vocational Education Planning District "D" (Penta County Joint Vocational School District)	13,175,455	4,714,127	18,427,184	6,593,186	5,251,741	1,879,059

obtain the potential *increase* in total net social benefits that would accrue from increasing participation in each of the four sample vocational education planning districts. The results are shown in Column (c), Table 7. For vocational education planning district A, e.g. it is estimated that the increase in 11th and 12th grade participation in vocational programs would bring about additional net social benefits amounting to $3,193,954 or $953,875 depending on whether the increase in vocational enrollment came from potential dropouts or academic enrollees.

2. Extension: Ohio's Vocational Education Planning Districts

The results obtained from the analysis of the four sample vocational education planning districts were used to estimate for each of the remaining 103 vocational education planning districts: (i) the total net social benefits from vocational education programs on the basis of 11th and 12th grade enrollment in Fiscal Year 1973 and (ii) the potential *increase* in these benefits, that would accrue from increasing vocational enrollment to 40 per cent of 11th and 12th grade average daily membership.

(i) *Net Social Benefits from Fiscal Year 1973 Participation*

Enrollment in the six vocational education areas (all vocational education areas offered at the 11th and 12th grade level excluding Special Needs and Home Economic-Useful) by program was used to estimate the net social benefits from vocational education in each of the 103 vocational education planning districts.

Since no direct measurement of social present value by program was made in any of these vocational education planning districts, measures of Social Present Value I and Social Present Value II computed for the four sample planning districts were used as approximate measures of the net benefits to society at large from investment in the education of individuals through each of the vocational programs offered in the non-sample planning districts.

A total of 160 vocational programs were offered during Fiscal Year 1973 under the six vocational education areas at the 11th and 12th grade level in Ohio's 107 vocational education planning districts. Of these, 55 programs were evaluated in the four sample vocational education planning districts and hence individual program social present value measures, could

TABLE 8

TOTAL NET SOCIAL BENEFITS

BY VOCATIONAL EDUCATION PLANNING DISTRICT

VOCATIONAL EDUCATION PLANNING DISTRICT	NO.	TOTAL NET SOCIAL BENEFITS FISCAL YEAR 1973 PARTICIPATION (a)		TOTAL NET SOCIAL BENEFITS 40 PER CENT PARTICIPATION (b)		POTENTIAL INCREASE IN TOTAL NET SOCIAL BENEFITS (c)	
		SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II
Apollo Joint Vocational Center	1	$ 5,656,806	$ 1,642,017	$ 8,636,335	$ 2,506,896	$ 2,979,529	$ 864,880
Lima City	2	4,211,679	1,235,453	4,211,679	1,235,453		
Ashland County JVSD	3	4,169,571	1,219,844	5,486,278	1,605,056	1,316,707	385,212
Ashtabula County JVSD	4	6,986,871	2,699,396	10,312,719	3,984,349	3,325,848	1,284,953
Tri-County JVSD	5	8,578,554	2,238,029	9,505,323	2,479,810	926,769	241,781
Belmont County JVSD	6	9,393,976	2,620,610	10,584,759	2,952,799	1,190,783	332,189
Southern Hills JVSD	7	2,445,913	896,624	2,445,913	896,624		
Butler County JVSD	8	4,732,634	1,674,712	7,854,992	2,779,604	3,122,358	1,104,892
Hamilton City	9	5,362,420	1,568,062	6,217,296	1,818,042	854,876	249,980
Middletown City	10	2,920,186	838,717	5,588,870	1,605,200	2,668,684	766,483
Springfield-Clark County JVSD	11	10,762,308	3,939,658	17,358,544	6,354,281	6,596,242	2,414,623
U. S. Grant JVSD	12	534,048	212,729	1,504,360	599,238	970,312	386,508
West Clermont Local	13	2,796,703	922,121	2,796,703	922,121		
Columbiana County JVSD	15	1,893,237	523,702	5,568,342	1,540,303	3,675,105	1,016,600
East Liverpool City	16	2,881,577	935,270	3,115,218	1,011,102	233,641	75,832
Bedford City	18	3,394,764	1,039,246	5,104,907	1,562,775	1,710,143	523,529
Cleveland City	19	56,213,808	17,366,432	56,213,808	17,366,432		
Cleveland Heights	20	1,201,715	385,261	7,510,718	2,407,884	6,309,003	2,022,623

TABLE 8 (cont.)

TOTAL NET SOCIAL BENEFITS
BY VOCATIONAL EDUCATION PLANNING DISTRICT

VOCATIONAL EDUCATION PLANNING DISTRICT	NO.	TOTAL NET SOCIAL BENEFITS FISCAL YEAR 1973 PARTICIPATION (a)		TOTAL NET SOCIAL BENEFITS 40 PER CENT PARTICIPATION (b)		POTENTIAL INCREASE IN TOTAL NET SOCIAL BENEFITS (c)	
		SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II
East Cleveland City	21	$ 2,987,485	$ 885,240	$ 3,781,626	$ 1,120,556	$ 794,141	$ 235,316
Euclid City	22	1,984,261	630,836	8,354,775	2,656,157	6,370,514	2,025,321
Lakewood City	23	3,998,493	1,219,666	13,554,210	4,134,460	9,555,717	2,914,794
Maple Heights City	24	3,783,098	1,092,725	3,783,098	1,092,725		
Mayfield City	25	2,990,593	960,967	5,512,616	1,771,367	2,522,023	810,400
Parma City	26	11,526,015	4,012,394	14,872,268	5,177,282	3,346,253	1,164,888
Cuyahoga Valley JVSD	27	9,541,822	3,557,893	14,623,477	5,452,708	5,081,655	1,894,815
S. W. Cuyahoga County JVSD	28	7,562,884	2,940,191	12,552,490	4,879,989	4,989,606	1,939,798
Darke County Area JVSD	29	5,857,783	1,713,596	6,007,980	1,757,534	1,501,971	43,938
Four County JVSD	30	17,892,304	5,930,792	18,445,664	6,114,217	553,368	183,425
Delaware County JVSD	31	3,761,638	1,059,272	4,464,853	1,257,295	7,032,151	198,023
ERJVE JVSD	32	9,616,738	3,502,751	12,329,147	4,496,707	2,712,409	987,955
Sandusky City	33	2,204,103	642,998	3,082,661	899,298	878,558	256,299
Fairfield County JVSD	34	5,569,934	1,543,489	8,737,149	2,421,159	3,167,215	877,670
Columbus City	35	15,749,144	5,551,843	39,372,832	13,879,594	23,623,696	8,327,751
Eastland JVSD	36	8,530,634	3,071,012	14,397,685	5,183,137	5,867,051	2,112,125
Central Ohio JVSD	37	3,680,302	1,157,504	6,513,802	2,048,679	2,833,500	891,175
South-Western City	38	7,361,020	2,440,103	7,361,020	2,440,103		
Penta County JVSD	39	13,175,455	4,714,127	18,427,184	6,593,186	5,251,741	1,879,059
Gallia County JVSD	40	4,653,270	1,551,851	6,600,384	2,201,206	1,947,114	649,355

TABLE 8 (cont.)

TOTAL NET SOCIAL BENEFITS

BY VOCATIONAL EDUCATION PLANNING DISTRICT

VOCATIONAL EDUCATION PLANNING DISTRICT	NO.	TOTAL NET SOCIAL BENEFITS FISCAL YEAR 1973 PARTICIPATION (a)		TOTAL NET SOCIAL BENEFITS 40 PER CENT PARTICIPATION (b)		POTENTIAL INCREASE IN TOTAL NET SOCIAL BENEFITS (c)	
		SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II
Kenston Local	41	$ 3,140,699	$ 959,242	$ 7,477,851	$ 2,283,909	$ 4,337,152	$ 1,324,667
Greene JVSD	42	8,804,602	3,303,021	15,583,360	5,846,053	6,778,758	2,542,032
Cincinnati City	43	13,121,683	4,161,132	24,412,400	7,741,636	11,290,732	3,580,504
Great Oaks JVSD	44	20,300,672	7,349,716	46,137,808	16,703,899	25,837,136	9,354,183
Northwest Local	45	4,077,902	1,317,605	5,194,779	1,678,477	1,116,877	360,873
Hancock County JVSD	47	6,380,812	1,777,949	8,233,304	2,294,128	1,852,492	516,179
Hardin County JVSD	48	3,297,287	1,049,210	3,297,287	1,049,210		
Jefferson County JVSD	50	2,195,266	753,388	7,635,713	2,620,479	5,440,447	1,867,092
Knox County JVSD	51	5,807,135	1,620,237	5,836,314	1,628,378	29,180	8,141
Lake County JVSD	52	3,985,068	988,804	8,216,633	2,038,770	4,231,565	1,049,966
Mentor-Willoughby-Eastlake City	53	8,860,257	2,910,285	16,109,554	5,291,427	7,249,297	2,381,142
Lawrence County JVSD	54	2,566,558	665,544	6,416,397	1,663,885	3,849,839	998,331
Licking County JVSD	55	7,050,953	2,672,789	11,281,518	4,276,464	4,230,565	1,603,675
Ohio Hi-Point JVSD	56	8,562,220	2,602,318	8,562,220	2,602,318		
Lorain City	57	6,486,853	1,959,273	7,268,181	2,195,262	781,328	235,990
Lorain County JVSD	58	11,748,633	4,272,192	19,419,200	7,061,474	7,670,582	2,789,282
Oregon City	59	2,458,167	729,321	2,761,984	819,461	303,818	90,141
Sylvania City	60	2,909,674	852,120	5,016,676	1,469,170	2,107,002	617,051
Toledo City	61	22,357,776	6,677,141	25,551,728	7,631,015	3,193,954	953,875
Washington Local	62	3,404,170	957,650	5,535,233	1,557,154	2,131,063	599,504

TABLE 8 (cont.)

TOTAL NET SOCIAL BENEFITS

BY VOCATIONAL EDUCATION PLANNING DISTRICT

VOCATIONAL EDUCATION PLANNING DISTRICT	NO.	TOTAL NET SOCIAL BENEFITS FISCAL YEAR 1973 PARTICIPATION (a)		TOTAL NET SOCIAL BENEFITS 40 PER CENT PARTICIPATION (b)		POTENTIAL INCREASE IN TOTAL NET SOCIAL BENEFITS (c)	
		SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II
Mahoning County JVSD	63	$10,026,789	$ 3,840,849	$18,066,272	$ 6,920,443	$ 8,039,488	$ 3,079,594
Youngstown City	64	7,570,775	2,290,662	11,602,717	3,510,593	4,031,942	1,219,931
Medina County JVSD	66	3,841,125	1,094,059	8,488,676	2,417,810	4,647,551	1,323,751
Meigs Local	67	2,698,680	939,446	2,698,680	939,446		
Auglaize-Mercer JVSD	68	5,275,943	1,704,384	7,105,632	2,295,466	1,829,689	591,082
Upper Valley JVSD	69	6,512,141	1,974,446	9,172,030	2,780,909	2,659,889	806,464
Switzerland of Ohio Local	70	693,265	218,931	2,116,834	668,492	1,423,570	449,561
Dayton City	71	16,366,249	5,325,915	17,741,184	5,773,348	1,374,939	447,434
Mad River Local	72	5,044,529	1,539,495	11,530,336	3,518,845	6,485,807	1,979,350
Montgomery County JVSD	73	21,073,824	7,659,705	26,260,192	9,544,805	5,186,381	1,885,100
Morgan Local	74	2,047,047	627,423	2,047,047	627,428		
Muskingum Area JVSD	75	14,083,238	4,743,647	38,321,616	12,907,885	24,238,384	8,164,238
Pike County Area JVSD	77	2,699,586	709,346	3,139,052	824,820	439,466	115,474
North Portage County JVSD	78	4,306,608	1,882,336	6,023,234	2,632,639	1,716,626	750,304
Putnam County JVSD	80	3,558,570	1,200,731	3,558,570	1,200,731		
Madison Local	81	1,424,255	487,668	1,424,255	487,668		
Mansfield City	82	4,207,739	1,204,945	4,864,437	1,392,999	656,699	188,054
Pioneer JVSD	83	9,514,261	2,705,979	9,962,574	2,885,841	448,314	129,862
Pickaway-Ross County JVSD	84	3,113,160	1,006,808	6,995,863	2,262,488	3,882,703	1,255,681
Vanguard JVSD	85	9,161,863	2,582,897	9,161,863	2,582,897		

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TABLE 8 (cont.)

TOTAL NET SOCIAL BENEFITS
BY VOCATIONAL EDUCATION PLANNING DISTRICT

VOCATIONAL EDUCATION PLANNING DISTRICT	NO.	TOTAL NET SOCIAL BENEFITS FISCAL YEAR 1973 PARTICIPATION (a)		TOTAL NET SOCIAL BENEFITS 40 PER CENT PARTICIPATION (b)		POTENTIAL INCREASE IN TOTAL NET SOCIAL BENEFITS (c)	
		SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II
Scioto County JVSD	86	$ 8,155,607	$ 2,351,160	$ 8,840,764	$ 2,548,682	$ 685,158	$ 197,523
Tiffin Area JVSD	87	4,829,255	1,287,433	6,948,564	1,852,420	2,119,309	564,986
Alliance City	89	5,704,905	1,887,623	6,711,650	2,220,732	1,006,746	333,109
Canton City	90	7,089,908	2,005,810	9,779,181	2,766,634	2,689,273	760,825
Massillon City	92	3,974,746	1,121,941	3,974,746	1,121,941		
Plain Local	93	3,365,211	1,007,361	4,206,512	1,259,199	841,301	251,839
Western Stark County JVSD	94	1,434,785	553,365	2,049,691	790,521	614,906	237,156
Akron City	95	18,667,792	5,811,338	21,334,592	6,641,526	2,666,814	830,189
Barberton City	96	6,118,727	1,960,534	8,439,615	2,704,184	2,320,888	743,650
Six District Vocational Education Compact	97	7,407,784	2,447,662	13,468,691	4,450,296	6,060,907	2,002,634
South Summit JVSD	98	2,123,692	728,231	3,539,485	1,213,717	1,415,793	485,487
Trumbull County JVSD	99	3,143,564	1,295,705	13,236,062	5,455,596	10,092,498	4,159,891
Warren City	100	4,139,020	1,229,369	5,500,357	1,633,712	1,361,337	404,344
Buckeye JVSD	101	5,867,792	1,588,700	9,580,070	2,593,795	3,712,278	1,005,096
Van Wert County Area JVSD	102	5,890,585	1,765,379	5,890,585	1,765,379		
Warren County JVSD	103	3,069,640	796,993	6,264,567	1,626,515	3,194,927	829,522
Washington County JVSD	104	6,302,722	1,903,353	6,497,650	1,962,219	194,929	58,866
Wayne County JVSD	105	9,784,140	2,814,665	10,060,810	2,894,256	276,670	79,592
Springfield Local	106	775,660	239,942	1,793,430	554,778	1,017,771	314,836
Ohio Valley Local	107	1,867,676	614,204	1,930,413	634,835	62,737	20,632

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TABLE S (cont.)

TOTAL NET SOCIAL BENEFITS

BY VOCATIONAL EDUCATION PLANNING DISTRICT

VOCATIONAL EDUCATION PLANNING DISTRICT	NO.	TOTAL NET SOCIAL BENEFITS FISCAL YEAR 1973 PARTICIPATION (a)		TOTAL NET SOCIAL BENEFITS 40 PER CENT PARTICIPATION (b)		POTENTIAL INCREASE IN TOTAL NET SOCIAL BENEFITS (c)	
		SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II	SOCIAL PRESENT VALUE I	SOCIAL PRESENT VALUE II
Coshocton Area JVSD	108	$ 3,371,469	$ 1,051,700	$ 3,715,115	$ 1,158,897	$ 343,647	$ 107,198
North Canton City	109	1,115,473	380,846	1,836,168	626,906	720,695	246,060
Crawford-Upper Sandusky JVSD	110	3,804,773	1,070,895	6,503,880	1,830,589	2,699,107	759,694
Tri-Rivers JVSD	111	5,907,413	1,622,660	9,053,503	2,486,835	3,146,090	864,175
Jackson Local	112	753,721	260,229	1,120,774	386,958	367,053	126,728
Perry Local	113	660,066	243,850	1,257,268	464,475	597,202	220,626
Eastern JVSD	114	2,454,794	768,506	4,959,178	1,552,536	2,504,384	784,031
Canton Local	115	1,547,228	618,000	2,069,868	825,755	522,641	208,755
TOTAL (All of Ohio's 107 Vocational Education Planning Districts)		$686,619,904	$220,932,496	$1,013,571,328	$329,850,880	$326,951,424	$108,918,528

Notes:

1. Social Present Value I measures the present value of the excess of working life-time social benefits over social costs per trainee assuming the trainee would have dropped out of high school except for enrollment in the vocational program.
2. Social Present Value II measures the present value of the excess of social benefits over social costs per trainee assuming the trainee's enrollment in the vocational program is in lieu of completing academic high school education.
3. No entry in Column C (Potential Increase in Total Net Social Benefits) indicates that the Fiscal Year 1973 participation rate in the vocational education planning district exceeded 40 per cent.

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be used as a basis for estimating the social present value per trainee in the non-sample vocational education planning districts.

For this purpose, use was made of the four classifications of vocational education planning districts on the basis of which the sample was constructed: *single* (independent), *multiple* (contract), small *joint vocational school* districts (less than 3,000 ADM), and large *joint vocational school* districts (more than 3,000 ADM).

For each of the 103 non-sample vocational education planning districts, the measures of social present value by program obtained in the representative planning district (in the sample) were utilized. In cases where the particular program was not offered in the representative planning district, the social present value measures used were based on a weighted average of the social present value measures as computed for the same program in the other sample vocational education planning districts. For programs which were not offered in any of the sample planning districts, a weighted average of social present value measures for all programs in the same vocational education area computed from the representative or other sample vocational education planning districts was used.

The total net social benefits from Fiscal Year 1973 participation for each of the 103 non-sample vocational education planning districts were calculated by multiplying the social present value (both measures: *Social Present Value I* and *Social Present Value II*) by enrollment figures (adjusted for probability of graduation) for males and females in each of the programs during Fiscal Year 1973. Total net social benefits of investment in all of the programs offered were then obtained by summing up over all programs within the vocational education planning district. The results are shown in Column (a), Table 8.

(ii) *Potential Increase in Total Net Social Benefits*

The potential increase in net social benefits from increasing participation to the 40 per cent level in each of the 103 non-sample vocational education planning districts was estimated as follows:

First, the total net social benefits from "40 per cent participation" were estimated. Enrollment in each of the programs during Fiscal Year 1973 was used as a base for the composition of vocational education enrollment

in each of the vocational education planning districts. The enrollment in each program necessary to achieve a 40 per cent overall participation within the planning district was computed on the assumption of the same share by program in total enrollment as existed in Fiscal Year 1973. The projected enrollment in each program was then used to calculate total net social benefits that would result from achieving a 40 per cent participation rate, using the figures on social present value per trainee by program (estimated as explained in Section (i) above). The results are shown in Column (b), Table 8.

Second, the estimated total net social benefits with the Fiscal Year 1973 participation rate, shown in Column (a), Table 8, were then subtracted from the equivalent figure for "40 per cent participation"--Column (b)--to obtain the potential *increase* in total net social benefits that would accrue from increasing participation (or alternatively the foregone social benefits from limited participation as of Fiscal Year 1973) in each of the 103 non-sample vocational education planning districts. These results are shown in Column (c), Table 8. The last row of figures in Table 8 shows the totals for all of Ohio's 107 vocational education planning districts.

B. *Conclusions*

The purpose of quantitative economic analysis of public programs is to assist decision-makers in the allocation of a given set of scarce resources among numerous competing uses. This study addressed itself to the evaluation of the net social benefits from participation in vocational education at the senior high school level in the State of Ohio. Viewed as investment in human capital, vocational programs were evaluated in order to estimate the excess of social benefits over social costs that accrue from training an individual in any of the programs offered. Benefits were measured in terms of contributions to the value of goods and services produced in the economy over the individual's working lifetime as a result of completing a vocational program; costs in terms of the value of the goods and services that had to be given up in order to

provide the training. The measurement of benefits and costs of investment in an individual completing a vocational program, therefore, encompassed all costs and benefits to whomever they accrue in society.

Completion of a vocational program at the senior high school level (11th and 12th grade level) is undertaken as an alternative to completion of an academic high school education or to dropping out of high school upon completion of the 10th grade. Therefore, two measures of net social benefits realized from training an individual in a vocational program were used: (1) *Social Present Value I:* the present value of net social benefits from investment in an individual who completes a given vocational program when the individual would have otherwise dropped out of high school, and (2) *Social Present Value II:* the present value of these net social benefits when the individual's completion of the vocational program is *in lieu* of completion of an academic high school education. Also, since benefits and costs differ between females and males primarily because of differences in labor force participation rates between the sexes over the working life-time, separate calculations of Social Present Value I and Social Present Value II were made for males and females. Data on a sample of four vocational education planning districts were used representing the three organizational forms of Ohio's 107 vocational education planning districts: *single* (independent), *multiple* (contract), and *joint vocational school* districts. The calculated present value of the excess of social benefits over social costs per trainee by program provided the basis for estimating the total net social benefits from vocational education programs in each of the four sample vocational education planning districts: (1) on the basis of enrollment during the 1973 Fiscal Year and (2) on the basis of increased enrollment to 40 per cent of average daily membership at the 11th and 12th grade level. The difference between (1) and (2) provided an estimate of the *potential* increase in total net social benefits from increasing participation in vocational education to 40 per cent in each of the sample vocational education planning districts.

The results for the sample vocational education planning districts were then used to obtain similar estimates for the State's remaining 103 vocational educational planning districts. The computed estimates indicate that increasing the participation rate by senior high school students in

vocational education programs (excluding Home Economics Useful and Special Needs) to 40 per cent of average daily membership in all of the vocational education planning districts would result in a state-wide *increase* in net total social benefits amounting to a minimum of $108,918,528 and a maximum of $326,951,424, depending upon the percentage of increased enrollment in vocational education originating from students who would have otherwise completed an academic high school education and from students who would have dropped out after completion of the 10th grade had they not enrolled in vocational education programs.

The estimates for each of the vocational education planning districts are to be similarly interpreted as lower and upper bounds of *additional* net social benefits from increasing participation to the 40 per cent level.

The net social benefits from 1973 Fiscal Year participation and the potential increase in these benefits depend upon the size of the vocational education planning district, the 1973 Fiscal Year participation rate, the composition of enrollment in vocational programs, i.e. the percentage of total enrollment in the various vocational programs, and male-female enrollment structure. Estimates of potential increases in net social benefits from achieving a 40 per cent participation rate were based on the same *composition* of program enrollment as existed in Fiscal Year 1973. Since net social benefits per trainee vary for different vocational programs, any change in program composition within any vocational education planning district would result in actual total net social benefits greater or smaller than those projected depending on whether the change was towards programs with higher or lower net social benefits. The same observation applies to the female-male shares in program enrollment.

The estimated total net social benefits are, of course, based on estimates of social present value per trainee by vocational program and vocational education area. Calculation of social costs and social benefits used in these estimates are in turn based on the present structure of those costs and benefits. Future changes in costs (with their components of direct and indirect costs) or benefits due to changes in the structure of supply and demand for occupational skills, could alter the absolute and relative levels of net social benefits from the various vocational programs and consequently the total net social benefits from vocational education in each of the vocational education planning districts.